



PATENT  
454311-2232.1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s) : Susan J. WONG et al.  
Serial No. : 10/699,550  
Filing Date : October 31, 2003  
Title : DIAGNOSTIC TEST FOR WEST NILE VIRUS  
Examiner : Sharon L. Hurt  
Art Unit : 1648

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DECLARATION UNDER 37 C.F.R. §1.132

Mail Stop RCE  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

**WE, SUSAN J. WONG AND PEI-YONG SHI, declare and state that:**

1. We are the named inventors on the above captioned application (hereinafter "the present application") and are familiar with its prosecution history, including the Office Action mailed on February 22, 2006.

2. We, Susan J. Wong and Pei-Yong Shi, respectfully submit that we are experts in the field of serodiagnostic assays. Brief curricula vitae are attached as Appendices A and B. We have both been active researchers in this field for more than 6 years and, together and separately, have published more than 80 relevant primary articles in peer-reviewed journals and more than 8

review articles and contributions to books. We have obtained very substantial external research funding for our work in this area in open competition. We both lead research groups within Wadsworth Center in which we supervise more than 19 full-time research staff who are investigating aspects of diagnostic serology of human infections. We are both regularly asked to speak to the subject of serodiagnostic assays at national and international scientific meetings.

3. Accordingly, in view of our education, training and experience, we are considered by our peers to be experts in the field to which the present application pertains, and qualified to knowledgeably characterize the art to which the invention in the present application relates, and to speak as to the present application, and the invention claimed, including being qualified to present expert opinions about the present invention and literature in support of it, and documents cited against the present invention. Moreover, we respectfully submit that we are qualified to state the knowledge in the art, and that which would have been obvious and nonobvious to the skilled artisan.

4. It is our understanding that the Examiner rejected claims 74, 76-105, 126-128, 145, 156, and 162-202 under 35 U.S.C. §103(a) as being obvious over references Wang *et al.* (“Wang”), Valdes *et al.* (“Valdes”), Mandy *et al.* (“Mandy”), Scaramozzino *et al.* (“Scaramozzino”), and McDonell *et al.* (“McDonell”).

5. More in particular, we were advised that in the February 22, 2006 Office Action, these claims were rejected because the Examiner believed that it would have been obvious to the person of ordinary skill in the art at the time the invention was made to combine the teaching of Wang, Valdes and Mandy to use West Nile virus (WNV) recombinant nonstructural protein 5 (NS5) protein to detect WNV infections in humans and horses; that a person of ordinary skill in the art would have been motivated to use the NS5 and E proteins as immunodiagnostic assays for the detection of WNV in biological samples; that McDonell teaches a diagnostic kit with an immunogenic composition using ELISA and fluorescent labeling; and that one would have expected success because of the teachings of Scaramozzino who developed a rapid, sensitive PCR assay for the detection of flavivirus with NS5 gene sequences.

6. The recombinant NS5-based microsphere immunoassay of the present application is an assay for detection of human or equine WNV infection that is useful for (i) differentiating between WNV infection and dengue (DEN) virus or St. Louis encephalitis (SLE) virus; (ii)

differentiating between flavivirus vaccination and natural WNV infection; and (iii) indicating recent WNV infections.

7. The assay of the present invention was initially disclosed in Wong, S.J. *et al.*, Immunoassay Targeting Nonstructural Protein 5 to Differentiate West Nile Virus Infection from Dengue and St. Louis Encephalitis Virus Infections and from Flavivirus Vaccination, *Journal of Clinical Microbiology*, Sept. 2003, p. 4217-4223 (hereinafter, "Wong *et al.*"). Wong *et al.* was cited on the Information Disclosure Statement, form PTO-1449, filed March 7, 2005. The *Journal of Clinical Microbiology* is a peer-reviewed journal.

8. The assay of the present invention is a highly sensitive diagnostic method for differentiating between flaviviral infections. This method works repeatedly.

9. Prior to the publication of Wong *et al.*, such a highly sensitive method did not exist. This high sensitivity is due in part to the NS5 of WNV being covalently attached via its amino terminus to the surface of polystyrene microspheres. A suspension phase immunoassay using these microspheres is most specific for West Nile virus and only minimally cross reactive in sera from patients with other flavivirus infections. Moreover, the assay has a very low amount of non-specific reactions from other clinical conditions. In addition, until Wong *et al.*, the use of the West Nile recombinant NS5 as a diagnostic target (antigen) had not been demonstrated for specific detection of West Nile antibodies or, indeed, for the specific detection of *any* flavivirus. Even today, most flavivirus assays are based upon killed virus, extracted from cell cultures or infected suckling mouse brain. Others are based on non-infectious viral particles comprised principally of the envelope protein that induces broadly cross-reactive sera.

10. At the time of filing of the present application, the state of the art did not teach or suggest to one of skill in the art that recombinant NS5 could be used with the Luminex platform to arrive at the present invention. The reviewers of the Wong *et al.* manuscript had the following comments:

- REVIEWER 1: This paper provides data which may lead the way to the solution of a problem which has confounded and burdened the serologic diagnosis of flavivirus infection, e.g., cross reactivity.
- REVIEWER 2: The manuscript by Wong *et al.* describes a serological test for WNV infection based on an E. coli-expressed form of NS5. In the assay format

presented, this form of NS5 appears to be useful for distinguishing among infections with different flaviviruses.

11. The assay of the present invention has been shown by us to be useful for the detection of antibodies to WNV in the sera of vaccinated and naturally infected horses. This data was disclosed in Udeni, B.R. *et al.*, Detection Of Antibodies To West Nile Virus In Equine Sera Using Microsphere Immunoassay, J. Vet. Diagn. Invest. 18:392-395 (2006). Table 2, (page 194, left column), shows that the NS5 microsphere immunoassay had 100% specificity in equine sera.

12. There exist various other technologies that could possibly be applied to use of NS5, however at the time of filing the present application none of these had been demonstrated to be effective strategies. Based on our knowledge and skill, we believed that there was a likelihood that assay strategies based upon passive adsorption to surfaces might not introduce the epitope of NS5 in a conformation and manner necessary for recognition of West Nile antibodies.

13. In November 2004, Focus Diagnostics investigated the use of the WNV recombinant NS5 antigen, provided by us, for use in an ELISA format for the detection of NS5 antibodies in serum panel from WNV patients. An indirect ELISA using NS5 coated plates was used to detect IgG, and an IgM capture format was used to detect IgM. The IgM capture ELISA used an anti-NS5 monoclonal antibody to detect NS5 antigen bound to IgM captured on the plate. The serum panel consisted of 110 sera previously characterized for the presence of antibodies to the WNV pre M/E recombinant protein. For the detection of IgG antibody, very weak reactivity was noted. Regardless of the NS5 coating concentration, no signal above an optical density (OD) (450nm) of 0.5 was found, and only 5 of 25 WNV IgG positive samples gave an OD between 0.3 and 0.5. All other samples in the serum panel had ODs less than 0.25. The detection of NS5 IgM positive samples was not possible with the reagents supplied. Accordingly, based on these results, of indirect IgG ELISA, the NS5 antigen did not show much reactivity with patient samples that were IgG positive on the Luminex platform. This low reactivity indicates that NS5 antigen coated onto plates could not discriminate true IgG positive samples from IgG negative samples. Furthermore, attempts to use NS5 antigen on IgM capture ELISA format was not successful since the monoclonal anti-NS5 antibody that was available for use did not show binding activity with NS5 antigen coated onto ELISA plates. The failure of other assays, it is clear, is due to the structure and properties of the NS5 protein rather than to human error.

14. Other than the luminex platform claimed in the present application, which work well repeatedly, there are no methods of rapidly diagnosing against WNV and discriminating West Nile virus from other flavivirus infections.

15. We further declare that statements made herein of our own knowledge are true and all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Signature: Susan J. Wong  
Susan J. WONG

Date: 2/16/07

Signature: Pei-Yong Shi  
Pei-Yong SHI

Date: 2/16/07



## CURRICULUM VITAE

*Susan J. Wong*

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### CITIZEN:

USA and Canada

### EDUCATION:

University of Saskatchewan	Biochemistry	Ph.D. 1980
University of New Hampshire	Biochemistry	M.Sc. 1972
University of Wisconsin	Molecular Biology	B.Sc. 1969

### CERTIFICATION AND REGISTRATION:

Diplomate (No.80)	American Board of Medical Laboratory Immunology	1985
	Recertified	1998-2001
	Recertified	2001-2004
	Recertified	2004-2007
RT	Canadian Society of Laboratory Technologists	1976
Certificate of Qualification	New York State Department of Health (Diagnostic Immunology, Histocompatibility, Bacteriology-Molecular Techniques)	2002 -2004

### MEMBERSHIP:

American Society for Microbiology  
American Society for Rickettsiology  
American Society for Tropical Medicine and Hygiene  
Infectious Diseases Society of America  
International Conference on Diseases in Nature Communicable to Man (President 2004 – 2005)

## HONORS AND AWARDS

- 1999 Wadsworth Center Recognition Award
- 2000 NYSDOH Commissioner's Recognition Award – West Nile Virus Response
- 2002 Charles Shepard Science Award Nominee from CDC, USPHS
- 2003 Thomas Nakano Commendation from CDC, USPHS
- 2004 NYSDOH Commissioner's Recognition Award – SARS Response

## PROFESSIONAL AND RESEARCH EXPERIENCE:

Wadsworth Center New York State DOH Albany, New York	Research Scientist 6, Director Diagnostic Immunology, and Proficiency Testing (for DI and HIV)	Dec. 94 - Present
State University of New York at Albany	Assistant Professor Biomedical Sciences	Jan. 96 - Present
Regional Laboratory Red Deer Regional Hospital Centre Red Deer, Alberta, Canada	Clinical Specialist Immunology	1991 - 1994
Smith-Kline Beecham Clinical Laboratories Van Nuys, California	Manager, Immunology BioScience Laboratory	1991 (Mar to Aug)
Foothills Hospital Calgary, Alberta, Canada	Clinical Laboratory Immunologist	1988 - 1991
Foothills Hospital Calgary, Alberta, Canada	Laboratory Scientist Immunology	1982 - 1988
University of Calgary	Postdoctoral Fellow Medical Biochemistry	1980 - 1982
University of Liverpool United Kingdom	Postdoctoral Fellow Biochemistry	1980
University of Saskatchewan	Graduate Student Biochemistry Veterinary Physiology Dept.	1975 - 1980
	Technician (Research) Medicine and Pathology	1972 - 1975
University of New Hampshire	Graduate Student Biochemistry	1970 - 1972

Univ. of Rochester (NY)  
and Univ. of Minnesota  
(Mpls.)

Research Technician

1969 - 1970

**Grants and External  
Funding (Current and  
Recent)**

US Based Collaboration in Emerging Viral and Prion Diseases  
September '04 – September 05, (\$15,000/yr) Collaborator  
NIAID/NIH

Emerging Infections Program – Supplemental Surveillance of  
Human Granulocytic Ehrlichiosis. CDC/US PHS  
Develop specific immunoassay for He and other tick-borne diseases  
December '03 – December '04 (\$112,000/yr) PI

Enhanced Laboratory Capacity for West Nile Virus CDC  
Development of Diagnostic Assays for Human Infection by WNV.  
April '01 – April '04 (\$100,000/yr) Dr. Dale Morse, PI.

**Proposals Submitted  
(not funded)**

Proposal Submitted (October 15, 2000). “Research on the  
Laboratory Diagnosis and Pathogenesis of Lyme Diseases in the  
United States” to CDC for Cooperative Agreement. Program  
Announcement 01-005.

Three SBIR proposals to NIH and DOD (from Inter Science Inc  
with subcontract to Wadsworth) for Miniaturization of Laboratory  
Systems (“Lab-on-a-Chip”) submitted 1996, 1997.

Two SBIR proposals to NIH (with L Squared Diagnostics) on  
Tularemia (2002) and dengue fever (2004).

**Contracts and Subcontracts Awarded**

<u>Year</u>	<u>Company</u>	<u>Amount</u>	<u>Topic</u>
1997	Cambridge Diagnostics	\$2,076	Lyme Disease Assay
1999	Copalis Dia Sorin	\$7,973	Rubella Assay
2002	Abbott Laboratories	\$4,000	West Nile Assay
2002	NIAID	\$15,000	West Nile Assay
2003	Focus Technologies	\$17,500	West Nile Trial Site
2005	Spectral Diagnostics	\$13,095	West Nile Trial Site

**Patents**

United States Provisional Application 6/422, 755 filed October 31, 2002. (Susan J. Wong)  
“Diagnostic Test for West Nile Virus”

United States Provisional Application 454311-2260 Reference Number filed June 6, 2003.  
(Susan J. Wong and Pei Yong Shi). “Diagnostic Test for West Nile Virus.



### **Recent Workshop and Meeting Participation (2004-2006)**

- 2006 American Society of Retina Specialists, September 7-14, 2006. Cannes France.
- 2006 International Conference on Disease in Nature Communicable to Man. August 6-9, 2006. San Antonio, TX.
- 2006 National West Nile Virus Conference. February 22-24, 2006. San Francisco, CA.
- 2005 American Society of Tropical Medicine & Hygiene. December 11-14, 2005. Washington, DC.
- 2005 60<sup>th</sup> Annual International Conference on Diseases in Nature Communicable to Man. August 7-9, 2005, Calgary, Alberta, Canada.
- 2005 American Society of Microbiology – Eastern New York Branch. New technologies in microbiology. March 7, 2005, Albany Medical Center, Albany, NY.
- 2005 West Nile Virus Review and planning meeting (Public Health Agency of Canada). Jan 10-11, 2005. Ottawa, Ontario, Canada.
- 2005 National Conference on West Nile Virus in the United States. Feb 8-9, 2005. San Jose, CA.

### **PAPERS PUBLISHED (Also under S.J. Johnson, S.J. Bagley)**

1. Gardner, I.A, S.J. Wong, G.L. Ferraro, U.B. Balasuriya, P.J. Hullinger, W.D. Wilson, P.Y. Shi, N.J. MacLachlan. Incidence and Effects of West Nile Virus Infection in Vaccinated and Unvaccinated Horses in California. Vet. Res. 38 (2007) 109-116.
2. Beer, P.M, S.J. Wong, A.M. Hammad, N.S. Falk, M.R. O'Malley. Vitreous Levels Of Unbound Bevacizumab And Unbound Vascular Endothelial Growth Factor In Two Patients. Retina. 2006. 26:871-876.
3. Balasuriya, U.B., P.Y. Shi, S.J. Wong, V.L. Demarest, I.A. Gardner, P.J. Hullinger, G.L. Ferraro, J.D. Boone C.L. De Cino, A.L. Glaser, R.W. Renshaw, M. Ledizet, R.A. Koski, and N.J. MacLachlan. Detection of antibodies to West Nile virus in equine sera using microsphere immunoassay. J Vet Diagn Invest. 2006 July 18 (4): 392-5.
4. Nguyen, Q., S. Teran, J. Snedeker, C.B. Morrow, C. Huang, W. Wong, B. Wallace, L.F. Novick. CNS Sequelae in an Infant with Congenital West Nile Virus Infection. Infections in Medicine. Dec. 2005. pp. 626-628.
5. O'Connor, K. C., H. Appel, L. Bregoli, M.E. Call, I. Catz, J.A. Chan, N.H. Moore, K.G. Warren, S.J. Wong, D.A. Hafler, and K.W. Wucherpfennig. 2005. Antibodies from Inflamed Central Nervous System Tissue recognize Myelin Oligodendrocyte Glycoprotein.. Journal of Immunology. 175: 1974-1982.

6. De la Fuente, J., R.F. Massung, S.J. Wong, F.K. Chu, H. Lutz, M. Meli, F.D. von Loewenich, A. Grzeszczuk, A. Torina, S. Caracappa, A.J. Mangold, V. Naranjo, S. Stuenkel, and K.M. Kocan. Sequence Analysis of the msp4 Gene of *Anaplasma phagocytophilum* Strains. 2005. *Journal of Clinical Microbiology* 43:1309-1317.
7. Kumar, D., M.A. Drebot, S.J. Wong, G. Lim, H. Artsob, P. Buck, and A. Humar. 2004. A Seroprevalence Study of West Nile Virus Infection in Solid Organ Transplant Recipients. *Am J. Transplantation*. 4:1296-1301.
8. Wong, S.J., V.L. Demarest, R.H. Boyle, T. Wang, M. Ledizet, K. Kar, L.D. Kramer, E. Fikrig, and R.A. Koski. 2004. Detection of Human Anti-Flavivirus Antibodies with a West Nile Virus Recombinant Antigen Microsphere Immunoassay. *J. Clin. Microbiol.* 42:65-72.
9. Shi, P.-Y. and Wong, S.J. 2003. Serologic Diagnosis of West Nile virus infection. *Expert Rev. Mol. Diagn.* 3(6):89-97.
10. Wong, S.J., R. H. Boyle, V. L. Demarest, A. N. Woodmansee, L.D. Kramer, H. Li, M. Drebot, R. A. Koski, E. Fikrig, D. A. Martin, and P.-Y. Shi. 2003. Immunoassay Targeting Nonstructural Protein 5 to Differentiate West Nile Virus Infection from Dengue and St. Louis Encephalitis Virus Infections and from Flavivirus Vaccination. *J. Clin. Microbiol.* 41:4217-4223.
11. Barbet, A.F., P.F.M. Meus, M. Belanger, M.V. Bowie, J. Yi, A.M. Lundgren, A.R. Alleman, S.J. Wong, F.K. Chu, U.G. Munderloh, and S.D. Jauron. 2003. Expression of Multiple Outer Membrane Protein Sequence Variants from a Single Genomic locus of *Anaplasma phagocytophilum*. *Infect. Immun.* 71:1706-1718.
12. Lux, J.Z., D. Weiss, J.V. Linden, D. Kessler, B.L. Herwaldt, S.J. Wong, J. Keithly, P. Della-Latta and B.E. Scully. 2003. Transfusion-Associated Babesiosis after Heart Transplant. *Emerging Inf. Dis.* 9:116-119.
13. Wang, T. L.A. Magnarelli, J.F. Anderson, L.H. Gould, S.L. Buschmich, S.J. Wong and E. Fikrig. 2002. A Recombinant Envelope Protein-Based Enzyme-Linked Immuno-Sorbent Assay for West Nile Virus Serodiagnosis. *Vector Borne and Zoonotic Dis.* 2:105-109.
14. CDC (S. Wong, contributor). 2002. Intrauterine West Nile Virus Infection – New York, 2002. *MMWR* 51: 1135-1136.
15. Fine, A.D., C.B. Bridges, A.M. De Guzman, L. Glover, B. Zeller, S.J. Wong, I. Baker, H. Regnery, and K. Fukuda. 2001. Influenza A among patients with Human Immunodeficiency Virus: An Outbreak of Infection at a Residential Facility in New York City. *Clinical Infectious Diseases* 32:1784-91.
16. Wang, T., J.F. Anderson, L.A. Magnarelli, S.J. Wong, R.A. Koski and E. Fikrig. 2001. Immunization of Mice Against West Nile Virus with Recombinant Envelope Protein. *The Journal of Immunology* 167: 5273-5277.

17. Nash, D., F. Mostashari, A. Fine, J. Miller, D.O'Leary K. Murray, A. Huang, A. Rosenberg, A. Greenberg, M. Sherman, S. Wong, M. Layton *et al.* 2001. An outbreak of West Nile virus infection, New York City Area, 1999. *N Eng J Med* 334:1807-14.
18. Wang T, JF Anderson, LA Magnarelli, S Bushmich, S Wong, R Koski, and E Fikrig. 2001. West Nile Envelope Protein: Role in Diagnosis and Immunity. *Ann. NY Academy Sciences.* 951: 325-327.
19. Wong SJ and SJ Seligman. 2001. Long Term Stability of West Nile Virus IgM and IgG Antibodies in Diluted Sera Stored at 4 C. *Ann NY Acad. Sciences.* 951: 369-372.
20. Kulas K, V Demarest, and SJ Wong. 2001. Use of an Arboviral Immunofluorescent Assay in Screening for West Nile Virus. *Ann. NY Acad. Sciences* 951: 357-360.
21. Alleman, A.R., A.F. Barbet, M.V. Bowie, H.L. Sorenson, S.J. Wong and M. Belanger. 2000. Expression of a Gene Encoding the Major Antigenic Protein 2 Homolog of *Ehrlichia chaffeensis* and Potential Application for Serodiagnosis. *J. Clin. Micro.* 38: 3705-3709.
22. Knirsch, C.A., K. Jacob, D. Schoonmaker, J.A. Kiehlbauch, S.J. Wong, P. Della-Latta, S. Whittier, M. Layton, and B. Scully. 2000. An Outbreak of *Legionella micdadei* Pneumonia in Transplant Patients: Evaluation, Molecular Epidemiology and Control. *Am. J. Med.* 108:290-295.
23. Linden, J.V., S.J. Wong, F.K. Chu, G.B. Schmidt and C. Bianco. 2000. Transfusion-associated transmission of babesiosis. *Transfusion* 40:285-289.
24. CDC (S. Wong, "reporter"). 1999. Update: West Nile Virus. Encephalitis-New York, 1999. *MMWR.* 48:944-946, 955.
25. CDC (S. Wong, "reporter"). 1999. Update: West Nile-Like Viral Encephalitis-New York, 1999. *MMWR* 48:890-892.
26. CDC (S. Wong, "reporter"). 1999. Outbreak of West Nile-Like Viral Encephalitis-New York, 1999. *MMWR* 48: 845-849.
27. Wong, S.J., and J.A. Thomas. 1998. Cytoplasmic, Nuclear, and Platelet Autoantibodies in Human Granulocytic Ehrlichiosis Patients. *J. Clin Microbiol* 36: 1959-1963.
28. CDC (S. Wong, "reporter"). 1998. Statewide Surveillance for Ehrlichiosis-Connecticut and New York, 1994-1997. *MMWR* 47: 476-480.
29. Horowitz, H.W., E. Kilchevsky, S. Haber, M. Aguero-Rosenfeld, R. Kranwinkel, E.K. James, S.J. Wong, F. Chu, D. Liveris, and. I. Schwartz. 1998. Perinatal Transmission of the Agent of Human Granulocytic Ehrlichiosis. *New Engl. J. Med.* 339:375-378.
30. Chang, Y.F., V. Novosel, E. Dubovi, S.J. Wong, F.K. Chu, C.F. Chang, F. Del Piero, S. Shin, and D.H. Lein. 1998. Experimental Infection of the Human Granulocytic Ehrlichiosis Agent in Horses. *Veterinary Parasitology.* 78: 137-145.

31. Wallace, B.J., G. Brady, D.M. Ackman, S.J. Wong, G. Jacquette, E.E. Lloyd and G.S. Birkhead 1998. Human Granulocytic Ehrlichiosis in New York. 1998. Arch. Int. Med. 158:769-773.
32. Wong, S.J., G.S. Brady, and J.S. Dumler. 1997. Serological Responses to *Ehrlichia equi*, *Ehrlichia chaffeensis*, and *Borrelia burgdorferi* in New York State. J. Clin Microbiol 35: 2198-2205.
33. Ramani, R., A. Ramani, and S.J. Wong. 1997. Rapid Flow Cytometric Susceptibility Testing of *Candida albicans*. J. Clin. Microbiol 35: 2320-2324.
34. CDC (S. Wong "reporter") Human Granulocytic Ehrlichiosis - New York, 1995. MMWR 1995. 44:593-595.
35. Susan J. Wong and Leo J. Grady, Ehrlichia Infection as a Cause of Severe Respiratory Distress (letter) N. Eng. J. Med. 334: 273, 1996.
36. Shiozawa, C.\*-, Adachi, M.\*, Kashiwagi, N.\*-, Hayamo, M.+, Mizuta, T.\*, Ohta, Y.+, Gill, M.J.-, Matheson, D.S.-, Tamaoki, T-, Ohnishi, M\*-, Johnson, S.-, and Hakomori, S.# (Japan Immunoresearch Lab, Takasaki, Japan\*; Inst. of Med. Sci., Univ. of Tokyo, Minato-ku Japan+; Faculty of Medicine, Univ. of Calgary, Ab., Canada; Dept. of Pathology, Univ. of Washington, Seattle, W.A., U.S.A.#. Carbohydrate Antigen Expression of HIV Infected Human Lymphocytes. Proceeding of KAGOSHIMA International Symposium of Glycoconjugates in Medicine (1990).
37. Johnson, S.J., Gupta, V.S., Stevenson, K.J., and Frieisheim, J.H., Purification and characterization of dihydrofolate reductase from Walker 256 carcinosarcoma. Can. J. Biochem., 60, 1132-1142 (1982).
38. Sargent, A.U., and Johnson, S.J. The hemolytic equivalence of human, guinea pig, and canine complement components. Immunological communications, 9, 453-463 (1980).
39. Johnson, S.J., Metcalf, E.C., and Dean, P.D.G. The determination of dissociation constants by affinity electrophoresis on cibacron Blue F3G-A agarose-polyacrylamide gels. Anal. Biochem., 109, 63-66 (1980).
40. Johnson, S.J., Stevenson, K.J. and Gupta, V.S. Procion dyes as affinity ligands and reporter groups for dihydrofolate reductase from Walker 256 carcinosarcoma. Can. J. Biochem., 58, 1252-1257 (1980).
41. Sargent, A.U., S.J. Johnson and A.K. Richardson. Isolation and functional purification of the first seven components of canine hemolytic complement. Immunochemistry 13 (10), 823-829 (1976).
42. Zigman, S. and S.J. Bagley\*. Near ultraviolet effects on dogfish retinal rods. Exp. Eye Res., 12, 155-157 (1971).

43. Zigman, S. and S.J. Bagley\*. Effect of light on protein synthesis in smooth dogfish ocular tissues. *Annals Opth.* 1, 468-472 (1970).

## ABSTRACTS

1. Wong, S.J., P.M. Beer. Suspension Phase Microsphere Immunoassay of Bevacizumab Levels in Ocular Fluids and Sera. American Society of Retinal Specialists, Cannes France. September 7-14, 2006.
2. Wong, S.J., L.D. Kramer, G.D. Ebel. Powassan Encephalitis. International Conference on Diseases in Nature Communicable to Man. International Conference on Diseases in Nature Communicable to Man. San Antonio, TX. August 6-9, 2006.
3. Wong, S.J., U.B. Balasuriya, P-Y Shi, I.A. Gardner, P.J. Hullinger, G.L. Ferarro, J.D. Boone, C.L. DeCino, V.L. Demarest, A.L. Glaser, R.W. Renshaw, M. Ledizet, R.A. Koski, N.J. MacLachlan. Equine Antibody Responses to West Nile Virus Infection and Vaccination: Multiplex Microsphere Immunoassay with structural and Nonstructural Viral Proteins Compared to Plaque Reduction Neutralization. Annual West Nile Virus Conference. San Francisco, CA. February 22-24, 2006.
4. Campbell, M.M., S.J. Wong, E. Bell, S. Gohel, J. Paley, E. DeBernardo, A. Fine. False Positive West Nile IgM ELISA Tests in Outpatients with Febrile Illnesses, New York City, 2005. Annual West Nile Virus Conference. San Francisco, CA. February 22-24, 2006.
5. Wong, S.J., A.P. Dupuis II, A.M. Kilpatrick, P.P. Marra, A.L. Glaser, T. Victor, P. Daszak, L.D. Kramer. Comparison of Indirect ELISA and Plaque Reduction Neutralization to Multiplex Microsphere Immunoassay for Detection of Antibodies to West Nile Virus in Blood of Wild Birds. American Society for Tropical Medicine & Hygiene. 54<sup>th</sup> Annual Meeting, Washington, DC. December 11-14, 2005.
6. Wong, S.J., F. Chu, K. Kulas, J. S. Dumler, L. Berrada, S. Hennigan, D. Katz, B. Matyas, D. Pereira, S. Soliva, V. Berardi, K. Weeks, E. Fikrig. Laboratory Investigation of Human Granulocytic Anaplasmosis in the Housatonic River, River Valley, Berkshire County, Massachusetts 2004. International Conference on Diseases in Nature Communicable to Man, Calgary, Alberta, Canada. August 7-9, 2005.
7. Wong, S.J., M. Behr, F. Chu, V. Demarest, E. Fikrig, N. Ramamoothi, Y.-F. Chang, D. Lawrence. Multiplex Microsphere Immunoassay (MIA) for the Detection of Antibodies to Recombinant Proteins Derived from *Borrelia burgdorferi* and *Ixodes scapularis* Saliva in Retrievers with Lyme Borreliosis Associated Glomerulonephritis (GN). International Conference on Diseases in Nature communicable to Man. Calgary, Alberta, Canada. August 7-9, 2005.

8. Strik, N.I., A.R. Aleman, A. Barbet, H. Sorenson, F.P. Gaschen, N. Luckschander, S. J. Wong, F. K. Chu, A. Bjoersdorff, S. Stuen. Cross-reactivity of Major Surface Protein 5 of *Anaplasma phagocytophilum* and *Anaplasma marginale* and its Significance for Diagnostic Use. American College of Veterinary Pathology. Boston, MA. December 2005.
9. O'Connor, K.C., W.H. Robinson, P.L. DeJager, H. Fukaura, T. Chitnis, S.J. Wong, L. Steinman, K. Wucherpfennig, D. A. Hafler. Epitope spreading of autoantibodies recognizing myelin antigens in acute disseminated encephalomyelitis. 57<sup>th</sup> Annual Meeting of the American Academy of Neurology. 2005.
10. O'Connor, K.C., W. Robinson, K. Weichsel, H. Fukaura, S.J. Wong, L. Steinman, T. Chitnis, P. DeJager, K. Wucherpfennig and D. Hafler. High-throughput analysis of autoantibodies recognizing myelin antigens in acute disseminated encephalomyelitis. FOCIS. 2005.
11. Wong, S.J., V. Demarest, R. Boyle, A. Humar, D. Kumar, S. Shead, H. Artsob, M. Drebot. Comparison of Hemagglutination Inhibition and Microsphere Immunoassay for Detection of Human Antibodies to Flaviviruses in a West Nile Virus Seroprevalence Study of Solid Organ Transplant Recipients. International Conference on Diseases in Nature Communicable to Man. August 9, 2004.
12. Kulas, K., R. Boyle, V. Demarest, S.J. Wong, R. Koski. Microsphere Immunofluorescent Assay for the Detection of IgM Antibodies to West Nile Virus. INCDNCM. Beverly, MA. August 9, 2004.
13. Wong, S.J., M.T. Long, A.L. Glaser, S. Bushmich, V. Demarest, M.Z. Ledizet, R. Koski. Equine Antibody Responses to West Nile Virus (WNV) Infection and Vaccination Evaluated by Multiplex Microsphere Immunoassay (MIA) to Recombinant West Nile Envelope and Nonstructural Proteins 3 and 5. American Society for Tropical Medicine and Hygiene. 53 Annual Meeting, Miami, Florida. November 7-11, 2004.
14. Boyle, R.H., G. Ebel, V. L. Demarest, C. Bennett, K. Bernard, L. Kramer, E. Fikrig, R.A. Koski, H.A. Weingartl, P-Y. Shi, S.J. Wong. Recombinant West Nile Virus Nonstructural Protein 5 Enables Specific Detection of West Nile Infection in Chickens and Wild Birds. International Conference on Diseases in Nature Communicable to Man, Northern Arizona University, Flagstaff, AZ. August 6-8, 2003.
15. Wong, S.J., R.H. Boyle, V. L. Demarest, L. D. Kramer, M. Drebot, R.A. Koski, E. Fikrig, and P-Y. Shi. Recombinant Nonstructural Protein 5 Enables Detection of West Nile virus Infection and Discrimination from Flavivirus Vaccination in Humans. International Conference on Diseases in Nature Communicable to Man, Northern Arizona University, Flagstaff, AZ. August 6-8, 2003.
16. LaGier, M.J., K.A. Kent, S. J. Wong, M. A. Franke, L.D. Kramer, and K. Bernard. West Nile Virus as a Transfusion-transmitted Pathogen. APHL Conference on Emerging Infections, Denver, CO. March, 2002.

17. Demarest, V., R.H. Boyle, R. Bellisario, S. J. Wong, T. Wang, E. Fikrig, M. Ledizet, K. Kar, and R. Koski. A Microsphere Immunofluorescence Assay Measures Human Antibodies to Envelope Protein elicited by Flavivirus Infection. International Conference on Diseases in Nature Communicable to Man, University of British Columbia, Vancouver, B.C., August 10-12, 2002.
18. Koski, R., E. Fikrig, M. Chen, V. Demarest, R. Boyle, R. Bellisario, S. J. Wong. Simultaneous Measurement of Antibodies to *B. burgdorferi* and *A. phagocytophila* Recombinant Proteins by Microsphere Immunoassay. International Congress on Lyme Borreliosis. New York, New York. August 11-15, 2002.
19. Alleman, A.R., M. Belanger, V.P. Berardi, and S.J. Wong. Cross-reactive Linear and Conformational Epitopes Shared by Immunodominant Proteins of *Ehrlichia phagocytophila*, *E. chaffeensis*, and *Babesia microti*. American Society of Rickettsiology, Big Sky, Montana, August 18-22, 2002.
20. Kulas, K., S. Kondracki, and S.J. Wong. Q Fever in a Laboratory Animal Facility: Reinvestigation with Microimmunofluorescence and a Comparison to Complement Fixation. International Northwest Conference on Diseases in Nature Communicable to Man, Winnipeg, Manitoba, Canada, July 30-August 2, 2001.
21. Wang T, J.F. Anderson, L.A. Magnarelli, S. Bushmich, S. Wong, R. Koski, and E. Fikrig. West Nile Envelope Protein: Role in Diagnosis and Immunity. NY Academy of Science International Conference on West Nile Virus, White Plains, NY, April 1-4, 2001.
22. Wong S.J. and S.J. Seligman. Long Term Stability of West Nile Virus IgM and IgG Antibodies in Diluted Sera Stored at 4 C. NY Academy of Science International Conference on West Nile Virus, White Plains, NY, April 1-4, 2001.
23. Kulas K., V. Demarest, and S.J. Wong. Use of an Arboviral Immunofluorescent Assay in Screening for West Nile Virus. NY Academy of Science International Conference on West Nile Virus, White Plains, NY, April 1-4, 2001.
24. Linden, J.V., M.H. Kolakoski, and S.J. Wong. Transfusion-associated Babesiosis in Two Recipients. American Association of Blood Banks 53<sup>rd</sup> Annual Meeting, November 2000.
25. Linden, J.V., M.H. Kolakoski, and S.J. Wong. Transfusion-associated Babesiosis in an Elderly Patient. American Association of Blood Banks 53<sup>rd</sup> Annual Meeting, Nov, 2000.
26. Wong, S.J. and C.J. Carlyn. Severe and Fatal Human Granulocytic Ehrlichiosis in Patients with Hyposplenism. International Northwest Conference Diseases of Nature Communicable to Man. Ft. Collins, CO, July 30 - Aug 2, 2000.
27. Alleman, A.R., A.F. Barbet, M.V. Bowie, H.L. Sorenson, S.J. Wong and M. Belanger. Use of the major antigenic protein 2 (MAP2) homologues from *E. chaffeensis* for serodiagnosis of human monocytic ehrlichiosis infection #66 at Am. Society for Rickettsiology Meeting, Captiva Island, FL. (April, 2000).

28. Wong, S.J., V. Berardi, K. Weeks, F.K. Chu, R. Houghton, M. Lodes and D. Persing. Comparisons of ERF-1 Recombinant HGE Antigen Immunoblot and Enzyme immunoassay to Indirect Fluorescent Assay and Polymerase Chain Reaction for Laboratory Confirmation of Human Granulocytic Ehrlichiosis #19 at American Society for Rickettsiology Meeting, Captiva Island, FL, April 2000.
29. Nash, D., A. Fine, F. Moshtari, J. Miller, M. Layton, D. Gubler, J. Roehrig, G. Campbell, S. Wong and P. Smith. Clinical characteristics of 43 serologically positive, clinical cases of West Nile Virus (WNV) infection in New York City (NYC), 1999. Am. Soc. Trop. Med. Hyg. Meeting, Washington, D.C., November 28-30, 1999.
30. Ackelsberg, J., C. Carlyn, S. Wong, R. Limberger, A. Waring, C. Csiza, S. Kondracki, C. Maendel, A. Schuchat, D. Ackman. Epidemiology and Control of a Large Community *Mycoplasma* outbreak. Azithromycin Prophylaxis for Asymptomatic Carriage. Infectious Diseases Society of America, Philadelphia, PA. November 18-21, 1999.
31. J. Ackelsberg, C. Lohff, S. Kondracki, M. Hennessey, S. Wong, D. Schoonmaker-Bopp, S. Zaki, B. Fields, T. Tozok, and B. Wallace. Large Simultaneous Outbreaks of Legionnaire's Disease and Pontiac Fever: Need for cooling Tower Evaluations. Infectious Diseases Society of American, Philadelphia, PA. November 18-21, 1999.
32. Carlyn, C.J., A.L. Waring, C.K. Csiza, T.A. Halse, S.J. Wong, and R.J. Limberger. Application of PCR, culture and Complement Fixation for Diagnosis and Epidemiologic Assays of an Outbreak of *Mycoplasma pneumoniae*. Am. Soc. Microbiology, Chicago, IL. May, 1999.
33. Fox, D.J., D.M. Ackman, S.J. Wong, F.K. Chu, R.A. Duncan and D.J. White. International Conference on Emerging Infections, Surveillance for Human ehrlichioses in New York State (NYS). Atlanta, GA. March 8, 1998.
34. Duncan, R.A. and S.J. Wong. Comparison of Reactivity of *Borrelia burgdorferi* Immunoblots of Sera submitted for Lyme Disease and Ehrlichiosis. V-26 at 97<sup>th</sup> General Meeting Am. Soc. Microbiol, Atlanta, GA. May 4-8, 1997.
35. Wong, S.J., J.S. Keithly and M.J. Marchewka. Flow cytometric typing of *Leshmania guyanensis*. C-485 at 97<sup>th</sup> General Meeting Am. Soc. Microbiol. Atlanta, GA. May 4-8, 1997.
36. Wong, S.J. and J.A. Thomas. Cytoplasmic, Nuclear, and Platelet Autoantibodies in Human Granulocytic Ehrlichiosis Patients. American Society for Rickettsiology, Champion, PA. Sept. 21-24, 1997.
37. Chu, F.K., S. Dumler, G. Winslow, and S. Wong. Characterization and cultivation of the etiologic agent of HME in New York. American Society for Rickettsiology, Champion, PA. Sept 21-24, 1997.



38. Dawson, J.E., C.K. Warner, S.E. Little, D.E. Stalknecht, S. Wong and E.B. Shotts. Comparison of the Spacer Region Between the 16S and 23S rRNA Genes of Two Ehrlichia species. American Society for Rickettsiology, Champion, PA. Sept 21-24, 1997.
39. D.W. Fredericksen, S. Wong, M. Marchewka, Z. Tabib, W. Collen, and J. Keithly. Fluorescent Immunobead Detection of *Cryptosporidium parvum* and *Giardia lamblia*. Water Quality Technology Conference. Boston MA, Nov. 19, 1996.
40. S. J. Wong. A new look at Human Granulocytic Ehrlichiosis: The New York State Experience. DMID/ORDR Workshop on Human Ehrlichioses. NIAID-NIH. Rockville, MD. Sept. 25, 1996.
41. R.A. Duncan, P. Viscosi, S. Casterlin and S.J. Wong. Geographical Differences in Seroreactivity to Strains of *Borrelia burgdorferi* American Society for Microbiology, New Orleans, LA, Annual Meeting, May 1996.
42. K. Jacob, B. Scully, C. Knirsch, S. Whittier, M. Layton, S. Wong, D. Norton, and D. Schoonmaker. When it's Not Legionnaire's Disease: Investigation of a Nosocomial Outbreak of *Legionella micdadei* pneumonia in cardiac and renal transplant patients. A.P. Infection Control New Orleans, LA, June, 1996.
43. Susan J. Wong and J. Stephen Dumler. Serologic Studies of Human Ehrlichiosis in New York State Residents: 1994 to July 1995. 50th Annual Meeting. International Northwestern Conference Disease in Nature Communicable to Man. Calgary, Alberta, Canada, August 1995.
44. Susan J. Wong, Rory A. Duncan, and Geraldine S. Brady. Lyme Disease Serology from Human Granulocytic Ehrlichiosis Cases from New York State. American Society for Rickettsiology and Rickettsial Diseases, Pacific Grove, California, May 1996.
45. Susan J. Wong, Edward J. Wallace, and Jan S. Keithly, Enhanced Detection of *Giardia lamblia* and *Cryptosporidium parvum* by Flow Cytometry and Microscopy. Sixth East Coast Regional Meeting on Protozoology. Union College, Schenectady, New York, June 1995.
46. Edward J. Wallace and Susan J. Wong, Florescent Immunobead Enhanced Detection of *Giardia lamblia* and *Cryptosporidium parvum* by Flow Cytometry and Microscopy. 50th Annual Meeting. International Northwest Conference Disease in Nature Communicable to Man. Calgary, Alberta, Canada, August, 1995.
47. Susan Johnson. Application of BM-1's Potential as a Prognostic Marker. 1st Japan-Canada Joint Symposium - The New Lymphocyte Marker BM-1 as a Prognostic Marker for AIDS, Tokyo, December 8, 1988.
48. M.J. Gill, S. Johnson, M.-C. Poon, D. Matheson. AIDS in Canada and BM-1's Potential as Prognostic Marker. First Canada Japan Meeting, Takasaki, Japan, December 13, 1988.

49. O. Nobuhito Kashiwagi, M.J. Gill, S. Johnson, Takashi Kosedo, Masakazu Adachi, Masanori Hayami, Yoshihiro Ohta, Chiaki Shiozawa, Mamoru Ohnishi, Taiki Tamaoki, Kazuo Abe, Sen-Ichiro Hakomori. Expression of carbohydrate antigens in HIV infection (IV). Analysis of PBL from patients with anti-carbohydrate Monoclonal Antibody - Evaluation of BM-1 as prognostic marker. Univ. of Calgary Medicine (Canada). 2nd Meeting on AIDS Research, Kaoru, Shimada, December 8 (Thu.), 9 (Fri.) 1988, Noky Building 1-8-3 Ohtemachi, Chiyoda-ku, Tokyo.
  
50. M. John Gill, Nobuhito Kashiwagi, Susan Johnson, Man-Chiu Poon, Deirdre Church, Masanori Hayami, Yoshihiro Ohta, Mamoru Ohnishi, Taiki Tamaoki, Chiaki Shiozawa, Sen-Itiro Hakomori. Expression of carbohydrate antigens in HIV infection (V). Progressive changes with Time in Expression of Carbohydrate Antigen in PBL of HIV Infected Patients. Univ. of Calgary Medicine (Canada). 2nd Meeting on AIDS Research, Kaoru, Shimada, December 8 (Thu.) 9 (Fri.), 1988, Noky Building 1-8-3 Ohtemachi, Chiyoda-Ku, Tokyo.
  
51. C. Shiozawa , T. Kosedo, M. Adachi, T. Mizuta, J.A. Williamson, M. Hayami, N. Kashiwagi, M.Ohnishi, M.J. Gill, T. Bowen, M.-C. Poon, D.S. Matheson, S. Johnson, D. Church, S. Hakomori, T. Tamaoki. Expression of carbohydrate antigen on HIV-infected cells. In HIV infection and expression of Le-y antigen in T-cell line. International AIDS Conference, Stockholm, June, 1988.
  
52. M.J. Gill., N. Kashiwagi, M. Ohnishi, C. Shiozawa, M.-C. Poon, D.S. Matheson, S. Johnson, D. Church. Expression of carbohydrate antigen on HIV-infected cells. II. A change in expression of carbohydrate antigen in peripheral blood lymphocytes from HIV-infected patients. International AIDS Conference, Stockholm, June, 1988.
  
53. Takashi Kosedo, Masakazu Adachi, Toshinobu Mizuta, Katsuuki Nakajima, Kunikazu Akuzawa, J.A. Williamson, Masanori Hayami, Yoshihiro Ohta, Nobuhito Kashiwagi, Mamoru Ohnishi, Taiki Tamaoki, M.J. Gill, T. Bowen<sup>2</sup>, M.-C. Poon, D.S. Matheson, S. Johnson, D. Church, Kazuko Handa, Sen-Ichiro Hakomori. Expression Carbohydrate Antigen on HIV Infected Cells. I. HIV Infection and Expression of Ley Antigen in T-Cell line. 1st AIDS Research Meeting in JAPAN. Kyoto Kaikan, Univ. of Kyoto, Kyoto, Japan. December 21-22, 1987.
  
54. Nobuhito Kashiwagi, Mamoru Ohniski, Chiaki Shiozawa, Taiki Tamoaki, M.J. Gill, T. Bowen, M.C. Poon, D.S. Matheson, S. Johnson, D. Church, Masakazu Adachi, Toshinobu Mizuta, Takashi Kosedo, Katsuuki Nakajima, Kunikazu Akuzawa, J.A. Williamson<sup>1</sup>, Masanori Hayami, Yoshihiro Ohta, Kazuko Handa<sup>1</sup> Sen-Ichiro Hakomori. Expression of Carbohydrate Antigen on Infected Cells. II. A change in expression of carbohydrate antigen in peripheral blood lymphocytes from HIV infected patients. 1st AIDS Research Meeting in Japan. Kyoto Kaikan, Univ. of Kyoto, Kyoto, Japan. December 21-22, 1987.

55. Toshinobu Mizuta, Masakazu Adachi, Takashi Kosedo, Katsuuki Nakajima, Kunikazu Akutsu, J.A. Williamson, Nobuhito Kashiwagi, Mamoru Ohnishi, Chiaki Shiozawa, Taiki Tamaoki, M.J. Gill, T. Bowen, M.-C. Poon, D.S. Matheson, S. Johnson<sup>1</sup>, D. Church, Kazuko Handa, Sen-Ichiro Hakomori, Yoshihiro Ohta, Masanori Hayami. Expression of Carbohydrate Antigen on HIV Infected Cells. III. The expression of Ley antigen and the change of host cells. 1st AIDS Research Meeting in Japan. Kyoto Calkin, Univ. of Kyoto, Kyoto, Japan. December 21-22, 1987.
56. S.J. Johnson and M.J. Fritzler. Proliferating cell nuclear antigen. Abstract, Royal College of Physicians and Surgeons of Canada. Fifty-first Annual Meeting, Quebec City, Quebec, Canada. September 1982.
57. S.J. Johnson and M.J. Fritzler. Partial purification and characterization of proliferating cell nuclear antigen (PCNA). Abstract #337. Royal College of Physicians and Surgeons of Canada. Fiftieth Annual Meeting, Toronto, Ontario. September, 1981.
58. S.J. Johnson and K.J. Stevenson. Interactions of Walker 256 carcinoma dihydrofolate reductase with procion dyes and procion dye-sepharose gels. Abstracts with International Congress of Biochemistry, Toronto, Ontario, 1979. p. 169.
59. S.J. Johnson and V.S. Gupta. Dihydrofolate reductase of Walker carcinoma. Purifications and Properties. Can. Fed. Proc., 20: #221, 1977.
60. S. J. Johnson and A.U. Sargent. Species specificity for regulator binding (C3) and substrate cleavage (C5) by EAC42 and for activation of the membrane attack unit of serum complement. Proc. C.F.B.S. 17, #425, 1974.
61. S.J. Johnson and J.A. Stewart. Regulation of protein and RNA synthesis during postnatal development of the mouse brain. Proc. C.F.B.S. 16, #165, 1973.
62. A. Sargent, S. Johnson, Y. Yong. Functional incompatibility existing between C2 component of dog complement and guinea pig C5. Proc. C.F.B.S. 16, #443, 1973.
63. S. Johnson and S. Zigman. Inhibition of dogfish retina protein synthesis by near UV light. Biol. bull., 141, 391, 1971.
64. Zigman, S. and S.J. Bagley\*. UV and visible light effects on dogfish eye tissues. Biol. Bull., 137, 415, 1969.
65. Zigman, S. and S.J. Bagley\*. The effect of light on the dogfish eye. Biol. Bull., 135, 443, 1968.

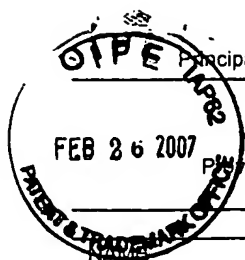
#### **Published Presentations on the Web**

1. <http://www.fda.gov/cber/minutes/wnv110402.pdf>. Detection of Human Antibodies to West Nile Virus with a recombinant Antigen Microsphere Immunofluorescence Assay. Pp.66-83.

2. [http://www.cdc.gov/ncidod/dvbid/westnile/conf/march\\_2002.htm](http://www.cdc.gov/ncidod/dvbid/westnile/conf/march_2002.htm). West Nile Virus Serology MRL IFA versus ELISA and New Technologies. Breakout Session 2, Lab Diagnosis.

#### **Biomedical Sciences SUNYA School of Public Health**

1. Lectures in three courses annually (Introductory Immunology, Biological Basis of Public Health, Epidemiology of Infectious Diseases) with a total of about 6 lectures given.
2. Current member of the Admissions Committee for professional programs (MPH, DrPH) at SPH. Past member of the Personnel Committee.
3. Previous mentor for SUNYA undergraduate research projects, REU students, CDCEIP fellows.
4. Previous host/mentor for visiting scientists from Taiwan, Canada, Maine, Pennsylvania, Florida, Washington and other locales.



Principal Investigator/Program Director (Last, First, Middle): Shi, Pei-Yong

## BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2. Follow this format for each person. DO NOT EXCEED FOUR PAGES.

NAME Shi, Pei-Yong		POSITION TITLE Research Scientist/Assistant Professor	
eRA COMMONS USER NAME Pei_Yong_Shi			
EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
Nanjing Normal University, China	B.S.	1989	Biochemistry
Georgia State University, Atlanta, GA	Ph.D.	1995	Molecular Virology
Yale University School of Medicine, New Haven, CT	Postdoc.	1998	Biochemistry

### A. Positions and Honors

#### Positions and Employment

- 1992-1995 Research Assistant, Ph.D. program in molecular virology, Department of Biology, Georgia State University, Atlanta, GA.
- 1996-1998 Postdoctoral associate, Department of Molecular Biophysics and Biochemistry, Yale University School of Medicine, New Haven, CT.
- 1998-2000 Principal Investigator, Department of Anti-infectious Diseases, Bristol-Myers Squibb Pharmaceutical Research Institute, Wallingford, CT.
- 2000- Research Scientist, Division of Infectious Diseases, Wadsworth Center, New York State Department of Health, Albany, NY.
- 2001- Assistant Professor (2001-2005), Associate Professor (2006-), Department of Biomedical Sciences, School of Public Health, State University of New York-Albany, NY.

#### Other Experience and Profession Services

- 2003- Reviewer for Journal of Virology, Virology, Journal of General Virology, and Journal of Clinical Microbiology
- 2003-2004 Ad Hoc reviewer, NIH Special Study Section on Bioterrorism and Emerging Infectious Diseases
- 2004 Member, NIH Bioshield Study Section
- 2004 Ad Hoc reviewer for grants sponsored by US Civilian Research and Development Foundation
- 2006- Ad Hoc reviewer, NIH Special Study Section on Viral and Eukaryotic Special Emphasis Panel
- 2007- Editorial Board of Virology

### B. Selected peer-reviewed publications (in chronological order)

#### Peer-reviewed Publications

1. Zhong, S.-D., Nolan, W.G., and Shi, P.-Y. 1993. Temperature-induced changes in photosynthetic activities and thylakoid membrane properties of *Euglena gracilis*. *Plant Science* 92, 121-127.
2. Shi, P.-Y., Brinton, M.A., Veal, J.M., Zhong, Y.Y., and Wilson, W.D. 1996. Evidence for the existence of a pseudoknot structure at the 3' terminus of the flavivirus genomic RNA. *Biochemistry* 35, 4222-4230.
3. Shi, P.-Y., Li, W., and Brinton, M.A. 1996. Cell proteins bind specifically to West Nile virus minus-strand 3' stem-loop RNA. *J. Virol.* 70, 6278-6287.
4. Shi, P.-Y., Sklyarevskaya, T., Kebbekus, P., Brinton, M.A., and Wilson, W.D. 1997. Analysis of the structure and folding of the 3' genomic RNA of flaviviruses. *Nucleic Acids Symp. Ser.* 36, 52-55.
5. Shi, P.-Y., Maizels, N., and Weiner, A.M. 1997. Recovery of soluble, active recombinant protein from inclusion bodies. *BioTechniques* 23, 1036-1038.
6. Brinton, M.A., Kurane, I., Mathew, A., Zeng, L., Shi, P.-Y., Rothman, A., Ennis, F.A. 1998. Immune mediated and inherited defenses against flaviviruses. *Clin. Diagn. Virol.* 10, 129-139.

7. **Shi, P.-Y.**, Weiner, A.M., and Maizels, N. 1998. A top-half minihelix is a good substrate for the eubacterial CCA-adding enzyme. *RNA*. 4, 276-284.
8. **Shi, P.-Y.**, Maizels, N., and Weiner, A.M. 1998. CCA addition by tRNA nucleotidyltransferase: polymerization without translocation? *EMBO J.* 17, 3197-3206.
9. Maizels, N., Weiner, A.M., Yue, D., and **Shi, P.-Y.** 1999. New Evidence for the genomic tag hypothesis: *Archaeal* CCA-adding enzyme and tDNA substrates. *Biol. Bull.* 196, 331-334.
10. Bernard, K.A., Maffei, J.G., Jones, S.A., Kauffman, E.B., Ebel, G.D., Dupuis II, A.P., Ngo, K.A., Nicholas, D.C., Young, D.M., **Shi, P.-Y.**, Eidson, M., White, D.J., Stone, W.B., and Kramer, L.D. 2001. Comparison of West Nile virus infection in birds and mosquitoes in New York State in 2000. *Emerg. Infect. Dis.* 7, 679-685.
11. G.D., Ebel, Dupuis II, A.P., Ngo, K.A., Nicholas, D.C., Kauffman, E.B., Jones, S.A., Young, D.M., Maffei, J.G., **Shi, P.-Y.**, Bernard, K.A., and Kramer, L.D. 2001. Partial genetic characterization of WNV strains isolated in New York State during the 2000 transmission season. *Emerg. Infect. Dis.* 7, 650-653.
12. **Shi, P.-Y.**, Kauffman, E.B., Ren, R., Felton, A., Tai, J.H., Dupuis II, A.P., Jones, S.A., Ngo, K.A., Nicholas, D.C., Maffei, J., Ebel, G.D., Bernard, K.A., and Kramer, L.D. 2001. High throughput detection of West Nile virus RNA. *J. Clin. Microbiol.* 39, 1264-1271.
13. **Shi, P.-Y.**, Tilgner, M., Lo, M.K., Kent, K.A. and Bernard, K.A. 2002. An infectious cDNA clone of the epidemic West Nile virus from New York City. *J. Virol.* 76, 5847-6856.
14. **Shi, P.-Y.**, Tilgner, M., and Lo, M.K. 2002. Construction and characterization of subgenomic replicons of New York strain of West Nile virus. *Virology* 296, 219-233.
15. Wang, T., Zhang, Z., Wallace, O. B., Deshpande, M., Fang, H., Yang, Z., Zadjura, L. M., Tweedie, D. L., Huang, S., Zhao, F., Ranadive, S., Robinson, B. S., Gong, Y.-F., Ricarrdi, K., Spicer, T. P., Deminie, C., Rose, R., Wang, H.-G. H., Blair, W. S., **Shi, P.-Y.**, Lin, P.-F., Colonno, R. J., and Meanwell, N. A. 2003. Discovery of 4-Benzoyl-1-[(4-methoxy-1H- pyrrolo[2,3-b]pyridin-3-yl)oxoacetyl]-2- (R)-methylpiperazine (BMS-378806): A novel HIV-1 attachment inhibitor that interferes with CD4-gp120 interactions. *J. Med. Chem.* 46, 4236-4239.
16. Wong, S.J, Boyle, R.H., Demarest, V.L., Woodmansee, A.N., Kramer, L.D., Li, H., Drebot, M., Koski, R.A., Fikrig, E., Martin, D.A., and **Shi, P.-Y.** 2003. An immunoassay targeting nonstructural protein 5 to differentiate West Nile virus infection from dengue and St. Louis encephalitis virus infections, and flavivirus vaccination. *J. Clin. Microbiol.* 41, 4217-4223.
17. Lo, M.K., Tilgner, M., Bernard, K.A., and **Shi, P.-Y.** 2003. Functional analysis of mosquito-borne flavivirus conserved sequence elements within 3' untranslated region of West Nile virus using a reporting replicon that differentiates between viral translation and RNA replication. *J. Virol.* 77, 10004-10014.
18. Lo, M.K., Tilgner, M., and **Shi, P.-Y.** 2003. A potential high-throughput assay for screening inhibitors of West Nile virus replication *J. Virol.* 77, 12901-12906.
19. Harvey, T.J., Liu, W.J., Wang, X.J., Linedale, R., Jacobs, M., Davidson, A., Le, T.T., Anraku, I., Suhrbier, A., **Shi, P.-Y.**, and Khromykh, A.A. 2004. Tetracycline-inducible packaging cell line for production of flavivirus replicon particles. *J. Virol.* 78, 531-538.
20. Fredericksen, B.L., Smit, M., Katze, M.G., **Shi, P.-Y.**, and Gale, M. Jr. 2004. The host cell response to West Nile virus infection involves the delayed activation of IRF-3 and limitation of virus spread. *J. Virol.* 78, 7737-7747.
21. Tilgner, M. and **Shi, P.-Y.** 2004. Structure and function of the 3' terminal six nucleotides of West Nile virus genome in viral replication *J. Virol.* 78, 8159-8172.
22. Tilgner, M., Deas, T.S., and **Shi, P.-Y.** 2005. The flavivirus-conserved penta-nucleotide in the 3' stem-loop of the West Nile virus genome requires a specific sequence and structure for RNA synthesis, but not for viral translation. *Virology* 331, 375-386.
23. Liu, W.J., Wang, X.J., Mokhonov, V.V., **Shi, P.-Y.**, Randall, R., and Khromykh, A.A. 2005. Inhibition of interferon signaling by New York 99 strain and Kunjin subtype of West Nile virus involves blocking STAT1 and STAT2 activation by nonstructural proteins. *J. Virol.* 79, 1934-1942.
24. Deas, T.S., Binduga-Gajewska I., Tilgner M., Ren P., Stein, D.A., Moulton, H.M., Iversen, P.L., Kauffman, E.B., Kramer, L.D., and **Shi, P.-Y.** 2005. Inhibition of flavivirus infections by antisense oligomers specifically suppressing viral translation and RNA replication. *J. Virol.* 79, 4599-4609.

25. Zhang, C., Cai, Z., Kim, Y.-C., Kumar, R., Yuan, F., **Shi, P.-Y.**, Kao, C., and Luo, G. 2005. Stimulation of the hepatitis C virus NS3 helicase by NS3 protease domain and RNA-dependent RNA polymerase. *J. Virol.* 79, 8687-8697
26. Puig-Basagoiti, F., Deas, T.S., Ren, R., Tilgner, M., Ferguson, D.M., and **Shi, P.-Y.** 2005. High-throughput assays using luciferase-expressing replicon, virus-like particle, and full-length virus for West Nile virus drug discovery. *Antimicrob. Agents Chemother.* 49, 4980-4988.
27. Balasuriya, U.B.R., **Shi, P.Y.**, Wong, S.J., Demarest, V.L., Gardner, I.A., Hullinger, P.J., Ferraro, G.L., Boone, J.D., De Cino, C.L., Glaser, A.L., Renshaw, R.W., Ledizet, M., Koski, R.A., and MacLachlan, N.J. 2006. Detection of Antibodies to West Nile Virus in Equine Sera using Microsphere Immunoassay. *J. Vet. Diagn. Invest.* 18(4), 392-5.
28. Julander, J.G., Winger, Q.A., Rickords, L.F., **Shi, P.Y.**, Tilgner, M., Binduga-Gajewska, I., Sidwell, R.W., Morrey, J.D. 2006. West Nile virus infection of the placenta. *Virology.* 347, 175-82.
29. Goodell, J. R., Puig-Basagoiti, F., Forshey, B.M. **Shi, P.Y.**, and Ferguson, D.M. 2006. Identification of compounds with anti-West Nile virus activity. *J. Med. Chem.* 49, 2127-2137.
30. Puig-Basagoiti, F., Tilgner, M., Forshey, B.M., Philpott, S.M., Espina, N.G., Wentworth, D.E., Goebel, S.J., Masters, P.S., Falgout, B., Ren, P., Ferguson, D.M., and **Shi, P.Y.** 2006. A triaryl pyrazoline compound inhibits flavivirus RNA replication. *Antimicrob. Agents Chemother.* 50, 1320-1329.
31. Gardner, I.A., Wong, S.J., Ferraro, G.L., Balasuriya, U.B., Hullinger, P.J., Wilson, W.D., **Shi, P.Y.**, MacLachlan, N.J. 2006. Incidence and effects of West Nile virus infection in vaccinated and unvaccinated horses in California. *Vet. Research.* 38(1):109-16.
32. Ray, D., Shah, A., Tilgner, M., Guo, Y., Zhao, Y., Dong, H., Deas, T.S., Zhou, Y., Li, H., and **Shi, P.Y.** 2006. West Nile Virus 5'-Cap Structure is Formed by Sequential Guanine N-7 and Ribose 2'-O Methylations by Nonstructural Protein 5. *J. Virol.* 80, 8362-8370.
33. Jerzak, G.V.S., Bernard, K.A., Kramer, L.D., **Shi, P.Y.**, and Ebel, G.D. 2006. The West Nile virus mutant spectrum is host-dependant and a determinant of mouse mortality. *Virology (Epub ahead of print)*.
34. Puig-Basagoiti, F., Tilgner, M., Bennett, C.J., Zhou, Y., Muñoz-Jordán, J.L., García-Sastre, A., Bernard, K.A., and **Shi, P.Y.** 2006. A mouse cell-adapted NS4B mutation attenuates West Nile virus virulence through suppression of viral RNA synthesis. *Virology (Epub ahead of print)*.
35. Ciota, A.T., Ngo, K.A. Lovelace, A.O., Payne, A.F., Zhou, Y., **Shi, P.Y.**, and Kramer, L.D. 2007. Generation of genetic diversity and the impact of the mutant spectrum on replication of West Nile virus. *J. Gen. Virol. (In press)*.
36. Zhou, Y., Ray, D., Zhao, Y., Dong, H., Ren S., Li, Z., Guo, Y., Bernard, K.A., **Shi, P.Y.**, and Li, H. 2007. Structure and function of flavivirus NS5 methyltransferase. *J. Virol. (Epub ahead of print)*.
37. Dong, H., Ray, D., Ren, S., Zhang, B., Puig-Basagoiti, F., Takagi, Y., Ho, C.K. Li, H., and **Shi P.Y.** 2007. Distinct RNA elements confer specificity to flavivirus RNA cap methylation events. *J. Virol. (Epub ahead of print)*.

#### **Books and Reviews**

1. Wang, W., Gong, Y.-F., and **Shi, P.-Y.** 2000. HIV/AIDS Epidemic and Current Chemotherapy: An Update. *Frontiers of Biotechnology & Pharmaceuticals.* Vol. 1, 282-304.
2. **Shi, P.-Y.** 2002. Identification of inhibitors of West Nile virus and other flaviviruses. *Curr. Opin. Invest. Drug.* 3, 1567-1673.
3. **Shi, P.-Y.** and Kramer, L.D. 2003. Molecular detection of West Nile virus RNA. *Expert. Rev. Mol. Diagn.* 3, 357-366.
4. Woodmansee A.N. and **Shi, P.-Y.** 2003. Recent developments in West Nile virus vaccine and antiviral therapy. *Expert Opin. Ther. Patents.* 13(8),1113-1125.
5. **Shi, P.-Y.** and Wong, S.J. 2003. Serologic diagnosis of West Nile virus infection. *Expert. Rev. Mol. Diagn.* 3(6), 733-741.
6. **Shi, P.-Y.** 2003. Genetic systems of West Nile virus and their potential applications. *Curr. Opin. Investig. Drugs.* 4(8), 959-965.
7. Ray, D. and **Shi, P.-Y.** 2006. Recent Advances in Flavivirus Antiviral Drug Discovery and Vaccine Development. *Recent Patents on Anti-Infective Drug Discovery.* 1, 45-55
8. Kramer, L.D., Li, J., and **Shi, P.-Y.** 2007. West Nile virus. *The Lancet Neurology* 6, 171-181.

**C. Research Support**

Contract N01-AI-25490

09/30/02-09/29/09

NIH/NIAID

PI: Laura Kramer

Role: Co-Investigator

**West Nile and Pox viruses: ecology, pathogenesis and immunology**

This is a multi-investigator contract to study the ecology, pathogenesis, and immunology of West Nile and Pox viruses. The scope of this contract includes development of more sophisticated diagnosis, studies of viral transmission cycle, viral pathogenesis, and immunology.

U01 AI061193-01

06/01/04-05/31/09

NIH/NIAID

Role: PI

**Identifying Inhibitors of West Nile and Dengue Viruses**

This grant is focused on identifying novel inhibitors against West Nile and dengue virus replication through high-throughput screening of compound libraries.

1R43AI065156-01

05/01/05-03/31/07

NIH/NIAID

PI: Patrick Iversen (AVI BioPharma Inc.)

Role: Co-Investigator

**Antisense Antiviral Agents for West Nile Virus Infection**

This is a SBIR grant to develop antisense agents of West Nile virus infection and to study the mechanism of action of the inhibitors.

1 R21 AI065562-01

07/01/05-06/30/07

NIH/NIAID

Role: PI

**West Nile virus life cycle in flavivirus-resistant cells**

This grant is proposed to characterize the molecular mechanism of flavivirus resistance.